Brain science already has much to contribute to education and will become even more important in the future, Mr. Jensen argues. More teachers need to use brain-based tools now.

BY ERIC P. JENSEN

Each of the three respondents to my article found some value in educational neuroscience, and none of them found any factual errors. Our differences are to be found in points of emphasis and degrees of caution. I am grateful for each response and value the comments.

Robert Sternberg raised excellent points. One was whether or not we are asking the right questions in education. I respect his right to question the very issues we are raising in education. He has invested much of his career in an important pursuit — understanding, defining, and applying new ways of thinking about intelligence in a less biased and far more practical way. I am always going to support that effort. He’s right, too, that intelligence can and should be measured in a much better fashion than it now is. On my top-three list of important priorities, I would certainly include assessment.

Sternberg’s second issue with brain-based education is not whether there are any educational implications to the research but “whether [educators] can take such research and derive unequivocal educational implications. If not, then we have metaphor, but we do not really have science.” At least, he continues, “not the kind of science that prescriptively is going to help us design educational interventions.” Because Sternberg believes that it is unclear whether there are unequivocal implications of brain research for education, he argues that we would do better to “focus the lion’s share of our attention on the many pressing issues that demand immediate solutions.” He concludes by suggest-
ing that it may be better to leave “the brain issue as one to be dealt with later, in the longer term.” That kind of thinking I do have a problem with.

Brain research isn’t going away; it’s increasing and will continue to do so. So we educators need better tools to deal with it. The research coming out is no trickle; it’s a flood. For educators to ignore the research on the brain would be like ignoring the melting of the polar ice caps because we’ve got to deal with famines and wars first. After all, one could argue, we have “unequivocal” research on the practical and prescriptive interventions for starvation and war. Yet the research on global warming is still fairly new and far from perfect. Nevertheless, I would argue, along with thousands of climate scientists, that global warming evidence is strong enough to allow us to move forward — even though it’s not unequivocal. Brain research, too, faces many unsolved mysteries. We all acknowledge that we have far to go, but we do know enough to move forward.

Sternberg wants “unequivocal findings,” but we may never have them. Nearly every study, in nearly every discipline, from physics to sociology to nutrition to neuroscience, has been overturned, broadened, narrowed, made irrelevant, dismissed, politicized, or redefined in the last 100 years. That’s the nature of science. In medicine, only a few years ago, it was standard procedure to give many heart patients a stent to help widen the passage of blood through the arteries. A few years ago, stent implant procedures were considered so solid that Vice President Dick Cheney’s heart operation was labeled “routine.” Now, new evidence suggests that those with stents may live no longer than those who don’t get one, but they pay much more and face higher risks. Were the original findings about using stents “unequivocal”?

In the field of educational neuroscience, there have been countless “errors of enthusiasm” made in the interpretation of research and its development into classroom applications. But unlike the mainstream medical profession, which claims to act on “unequivocal findings,” we are not putting thousands of lives in jeopardy every year when we act on findings that are “equivocal.” I don’t worry about those with questions; I worry about those who know all the answers. Neuroscientist Teri Jerimian of the University of California, San Diego, sees nothing wrong with trying out new ideas, as long as there’s no downside risk to them. I agree; it’s all about risk analysis.

I argue that we desperately need new understandings, new ways to think about learning and the brain, and a new set of values, criteria, and rules by which we can interpret, dismiss, or, potentially, apply neuroscience research. For example, what is a “brain-based” education policy? By what criteria do we judge best practices for optimizing learning? Can we at least give a teacher advice on what not to do in a classroom based on studies of affect, cognitive science, and social neuroscience? All of these possibilities are desperately worth considering.

Dan Willingham agrees that there can be value in the application of neuroscience findings in the classroom. But he suggests that this translation should occur only under two conditions. I agree with one of his conditions: that the application should “hold the promise of helping teachers or students.” For me, this condition is a no-brainer, and I would hope that every other educator and staff developer would agree.

Willingham’s other condition for the acceptance of neuroscientific research is that the data “must tell us something that we did not already know.” I disagree with this contention, and here’s why. Educators, unfortunately, are full of truisms that they “already know.” For example, the old saw “the apple doesn’t fall far from the tree” is trotted out thousands of times a year by educators who “already know” the impact of genes on a kid’s academic and behavioral profile. But that supposed truism (and countless others) is dead wrong.

The new field of epigenetics (“outside of the gene” influences) tells us that there are dozens of environmental experiences that can and do alter gene expression, including the expression of genes that affect the brain and our behavior. Altering gene expression allows for a biological responsiveness to environmental input that cannot be accounted for by heredity. This, in turn, opens up a whole new set of potential options for seeking behavioral and academic change in students. The triggers for gene expression include simple, everyday strategies that teachers can use. Student I.Q., parental intelligence, and traditional gene profiles are seen today to mean far less than they used to. All school administrators ought to be reading Bruce Lipton’s Biology of Belief or Ernest Rossi’s Psychobiology of Genetic Expression before they make any outdated comments about genes and the predictive powers of their observations based on meeting the parents. What some educators claim “they already know” scares me.

Here is another one of countless examples I could give that illustrate why the criterion that brain research “must tell us something that we did not already know” breaks down under scrutiny. Most of us would agree that the social culture at school can influence a student’s academic and emotional well-being. That, we can say, we “already knew.” Yet when I share with school administrators the recent neuroscientific evidence accumulat-
ed by Giacomo Rizzolatti of the University of Parma regarding mirror neurons, they are absolutely blown away. The discovery that humans are hard-wired (with the exception of those with an autism spectrum disorder) to imitate others provides specific, anatomical evidence for the impact of others on the brain. In addition, complementary research suggests that social conditions affect the hypothalamic-pituitary axis, which, in turn, affects our stress responses.

Over time, altered social conditions, which affect our stress levels, literally change our brains. Bruce McEwen, Alfred E. Mirsky Professor at Rockefeller University, has shown that chronic stress impairs cognition, creativity, social skills, memory, and decision making. This is highly relevant to school administrators, who carelessly allow students (usually at the secondary levels) to randomly socialize without regard for the impact of social activity on the brain. The “take-home message” of the science of mirror neurons is that social conditions alter brain structure and behaviors. The implication for school leaders is to arrange and manage the “social glue” at school through the use of mentors, adult collaborators, teams, and small-group relations. These activities should not occur by chance; working to build strong social connections should be official policy.

Suggesting that teachers need to know only that certain conditions (e.g., hunger) have an adverse effect on learning — not why they have such an effect — Willingham asks, “What then does an understanding of the neurobiology of hunger and its effect on cognition add to a teacher’s practice?” I offer that this understanding is highly relevant to educators. Why? Recent discoveries about glucose requirements in the hippocampus suggest 1) that teachers educate kids and parents better about the roles of glucose, fructose, and sucrose in learning and memory, 2) that teachers make glucose-boosting snacks available, and 3) that teachers understand that, since brief physical activity stimulates the liver to release glucose, energizers at times make good sense. Such activities can be done right before or after a learning session. That’s an example of a brain-based strategy to deal with managing glucose levels. Marise Parent of Georgia State University has shown that very extreme (very low and very high) glucose levels can impair learning and memory. We ought to be more vigilant about managing those levels in the classroom. Saying that there’s nothing practical that can be done about research on hunger and poor nutrition is both inaccurate and unempowering for teachers.

Willingham agrees “that neuroscientific data can be of use to education,” yet he encourages a more sobering appraisal of the data before application. This seems to imply that there’s a “drunken” misuse of the data going on. In many cases, I would agree with that assessment. Far too many uninformed educators, desperate for any change, will use a strategy randomly and call it “brain-based.” To Willingham’s caution, however, I would add that the more one knows about the contributions from neuroscience, the greater the number of applications that can be made in the classroom. I scan journals every single week, looking for studies with potential applications. Because I am both a generalist and an educator, I typically make more connections in education than most neuroscientists would. But they make more connections in their field. Unfortunately, most classroom teachers don’t have the time or background to scour the journals regularly, so they rely on others, some of whom are simply unqualified. We need more, not fewer, translators of brain research.

The final respondent, Dr. Judy Willis, is right in wanting to debunk the “neuromyths.” Doing so requires a constant effort, and all of us in the field need to share in it. Unfortunately, some critics, like John Bruer, go overboard in trying to debunk “neuromyths.” Amazingly, Bruer has made “sensitive periods” during the early years into a myth in The Myth of the First Three Years, using highly selective research to throw a “wet blanket” on recent research. As another example, Bruer reminds us that many studies were conducted “only” on animals and that we cannot translate animal studies to human classrooms. To me, that’s a no-brainer. Yet, if the study is done on a nonhuman primate, while there is a limited amount of useful cognitive and language data, there is much to learn, given the similarities of our nervous systems.

I appreciate that Willis believes that, as we go about building our bridge between science and the classroom, “we do need to take some temporary leaps of faith across the parts of the bridge that are not yet sturdy and try interventions before the research is complete.” This is the voice of reason. I would add that we must also ensure that there is no downside. When a classroom teacher uses an energizer because physical activity can release glucose, which may aid learning and memory, that’s a good idea. And there’s little downside to that application.

Willis adds that these applications of brain research may be especially appropriate for “at-risk” students or for those facing special circumstances. But all students have brains, and all brains share some systemwide similarities, both chemical and anatomical. I disagree that brain-based education ought to be thought of as a source of unconventional or “off-label” educational strategies. I have seen that brain-based tools can work for all stu-
dent. There’s no need to wait until “conventional teaching” has failed before pulling out the toolbox of “off-label” brain-based tools. There is nothing, absolutely nothing, that I have advocated in the past 25 years for classroom teachers that has not already been supported by complementary educational, cognitive, or sociological research. Brain research rarely suggests novel approaches, since teachers have always been pretty creative. But it can refine existing approaches, refocus priorities, and remind us that some ineffective approaches belong in the trash.

I agree strongly with Willis that brain-based advocates absolutely must share our successes with university departments of psychology and education. I have done that with the publication of the widely used Teaching with the Brain in Mind and other books. Many leaders at the university level have read the revised second edition; others have already made up their minds. Moreover, the field remains highly dynamic, and Oregon Health & Science University neuroscientist Jeri Janowsky said to me, “Neuroscience is exploding; anything over two years is considered old.” Willis suggests, with great insight, I might add, that researchers should make their data more accessible to teachers, who can develop new strategies that illuminate the applications of research in their classrooms. I could not agree more. More teachers need to be encouraged to try out brain-based strategies and to conduct action research, write up the results, and get them published.

Willis wisely adds that we must somehow learn to better evaluate and implement “the best, truly brain-based instruction in our classrooms.” That task is no easy feat, but it must be done. I have personally funded 16 major and 55 minor conferences that bring neuroscientists and educators together. It will take the continued — and perhaps even greater — collaboration of cognitive scientists, neurobiologists, administrators, staff developers, educators, and policy makers if all of us are to succeed. It is exchanges like these at collaborative conferences, along with other connections (for example, the new journal Mind, Brain, and Education), that move this field forward. Our goal is to develop for brain-based instruction an interdisciplinary domain, complete with sets of values, evaluative criteria, and peer review. We will have to develop better criteria for what qualifies and how we translate it. And, as Judy Willis said, we are indeed “on the brink of the most exciting time in history to be an educator.”

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